学位論文抄録

Comparison of the Upper Marginal Neurons of Cortical Layer 2 with Layer 2/3 Pyramidal Neurons in Mouse Temporal Cortex
（マウス側頭皮質浅層ニューロンの特徴づけ）

羅　　カン
Huan　Luo

熊本大学大学院医学教育部博士課程医学専攻HIGOプログラム専門コース

指導教員

宋　文杰　教授
熊本大学大学院医学教育部博士課程医学専攻知覚生理学

Abstract of the Thesis

Background and Purpose: Recent evidence suggests that excitatory neurons in layer 2/3 (L2/3) can have different properties. Sparse evidence from previous studies suggests that L2 neurons located at the border between L1 and L2 (referred to as L2 marginal neurons, L2MNs), have morphology distinct from a typical pyramidal neuron. In this study, we aimed to investigate whether the membrane properties and input/output properties of L2MN are different from those of typical pyramidal neurons in L2/3.

Methods: We combined multiple whole-cell patch-clamp recording and histological staining to study the morphology, intrinsic membrane properties and input/output properties of L2MN, and also compared with other L2/3 pyramidal neurons in mouse temporal cortex.

Results: L2MNs were homogeneous in intrinsic membrane properties but appeared diverse in morphology. In agreement with previous studies, L2MNs either had oblique or no obvious apical dendrites. The tufts of both apical and basal dendrites of these neurons invaded L1 extensively. All L2MNs showed a regular firing pattern with moderate adaptation. Compare with typical L2/3 pyramidal neurons that showed regular spiking (RS neurons), L2MNs showed a higher firing rate, larger sag ratio, and higher input resistance. No difference in the amplitude of excitatory and inhibitory postsynaptic potentials (EPSPs and IPSPs, respectively), evoked by L1 stimulation, was found between the two types of neurons, but the IPSPs in L2MNs had a slower time course than those in L2/3 RS cells. In paired recordings, unitary EPSPs showed no significant differences between synapses formed by L2MNs and those formed by L2/3 RS neurons. However, short-term synaptic depression examined with L2MN as the presynaptic neuron was greater when another L2MN was the postsynaptic neuron than when a L2/3 RS neuron was the postsynaptic neuron.

Conclusions: The distinct morphological features of L2MNs have developmental implications and the differences in electrophysiological properties between L2MNs and other L2/3 pyramidal neurons suggest that they play different functional roles in cortical networks.